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Silt in Suburbia

Pelting rains and rushing meltwater easily lay waste soils that have been stripped of their protective vegetative cover during construction. Soon water and scoured soil pour downslope and spill over adjacent residential areas to swirl and puddle among trees, shrubs, and children's swings. Deltas of silt fan out over streets, gutters, and driveways. Storm drainage sewers disappear beneath the flowing sediment and debris.

These are but part of a catalog of damages that ensue when land is left exposed to the ravages of weather or when other conservation needs go unheeded. For flooded basements, cracked walls, inoperative septic tanks, and washed out yards are not wrought by the whims of nature. They are the toll exacted by ignorance and abuse of the land.

In suburbia, where the bulldozer has taken over land from the plow, soil may wash off construction sites at far greater rates than on the farm. Erosion from cultivated land averages about 50 tons of soil per square mile annually; on exposed building sites erosion losses may increase *one thousandfold.*

Yet the same principles and technology that today keep soil in place on farms, ranches, and forests can also do the job in suburbia. Most of them stem from ARS research conducted cooperatively with the Soil Conservation Service and Agricultural Experiment Stations.

Suburban developers need to plan ahead and fit development to topography, soil limitations, and vegetation so as to create the least runoff and erosion. They should safeguard the vital ecological functions of nature, especially by keeping ground cover intact as a sponge for heavy rains, and by allowing streams to remain in their natural state to serve as inexpensive and efficient drainage channels. They should install any necessary engineering structures to retard and safely carry away the increased runoff that follows changes in land formations. Temporary basins installed ahead of time can help catch silt during and after removal of vegetation on the site. Sites awaiting construction should be temporarily seeded while mulches should be applied on sites under construction. Perhaps most important of all, the smallest possible area should stay cleared for the shortest possible time.

We can avoid blight and chaos in the building of suburban communities. It is up to informed and concerned citizens to work with local governments and builders for development that is thoughtful, planned, and controlled. Progress is possible without diminishing the spirit of man.

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COVER: ARS pathologist Theodor O. Diener, who discovered the new class of disease-producing particles called viroids, loads ribonucleic acid into tube containing polyacryamide gel. After electrophoresis, ribonucleic acid will be separated according to molecular weight. See page 3 (871X1084–16).

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the VIROID

Revolutionary discovery with far-reaching implications in disease research

FOR THE SECOND TIME in this century, a new class of disease-producing particles has been found—a discovery that has initiated new directions of research into the unknown causes of many diseases of both plants and animals, including man.

The discovery of the infectious particle, named the viroid, can be compared to the discoveries of bacteria in the late 1800's and viruses in the first half of this century.

The viroid, even smaller than the virus, was coaxed into revealing itself after 8 years of research on the potato spindle tuber disease by ARS pathologist Theodor O. Diener of the Plant Virology Pioneering Research Laboratory, Beltsville, Md. Potato spindle tuber disease, which has been known for more than 50 years, was previously thought to be caused by a virus.

Dr. Diener describes the potato spindle tuber viroid simply as a fragment of ribonucleic acid (RNA) with a molecular weight of approximately 50,000. The smallest known virus is 80 times larger

Dr. Diener holds vial containing RNA samples extracted from test plants. Technician Dennis Smith transfers RNA through micropipette onto gel for electrophoresis (871X1082–20).

than the potato spindle tuber viroid.

Viruses are composed of a core of nucleic acid (RNA or DNA) surrounded by a protective protein coat. RNA and DNA (deoxyribonucleic acid), the two kinds of nucleic acids found in all living cells, are closely related; DNA is the substance of the genes which are unique for each kind of organism. When a virus penetrates a cell, its nucleic acid takes over the role of directing cell activities and causes the cell to make more viruses like itself. This disrupts normal cell functions and thus causes disease.

The viroid also invades cells and disrupts their functions as effectively as any virus, despite its smaller size and lack of a protein coat. Dr. Diener conjectures that "viroids might be very primitive viruses that have not developed the genetic sophistication to protect themselves with a protein coat."

Before discovery of the viroid, scientists believed that no viral nucleic acid with a molecular weight under 1 million could take over cell activities and reproduce itself, thus causing disease. Dr. Diener's demonstration of the infectious capabilities of viroids opens a new path for research into diseases which seem to be viral in nature but whose causes have eluded scientists. Examples of these diseases are some human cancers, infectious hepatitis, multiple sclerosis, exocortis of citrus, chrysanthemum stunt, scrapie of sheep, and perhaps others. □

Dr. Diener interprets ultraviolet absorption profile of gel after electrophoresis to identify position of RNA (871X1082–29).

In the greenhouse tests, Mr. Smith infects potato plants with solution containing viroid particles (871X1084–12).

Mr. Fales sprays aerosol formulation of SBP–1390 into Peet-Grady testing chamber containing house flies (1071K1313–17).

Pyrethrum's potent cousin

LABORATORY TESTS with an experimental insecticide, designated SBP–1390, show the compound to be the most potent pyrethroid yet known.

Pyrethroids comprise a class of compounds which are chemically related to pyrethrins in pyrethrum, a "natural" insecticide of plant origin which reputedly was used as early as 2,000 years ago. Pyrethrum is well known for its qualities of low toxicity to man and animals and its nonpersistence in the environment. Insects do not build up resistance to it.

Resmethrin, a synthetic pyrethroid, is registered and commercially available. SBP–1390 is an isomer of that compound, (5-benzyl-3-furyl) methyl *trans-* (+) -2,2-dimethyl-3-(2-methylpropenyl) cyclopropanecarboxylate.

Insecticidal evaluation of SBP–1390 employing aerosols, sprays, and residual tests was made by entomologists John H. Fales and Otelia F. Bodenstein, physical scientists Rolland M. Waters and Earl S. Fields and biological laboratory technician Rebecca P. Hall, all at Beltsville, Md. The compound was also studied as an ingredient in insecticide coils and in a water medium against aquatic insects.

Researchers obtained mortality rates approaching or equalling 100 percent with aerosols against DDT-resistant house flies and Japanese beetles, and with sprays against DDT-susceptible house flies and German cockroaches. Sprays killed about 80 percent of the yellow-fever mosquitoes.

For the first week after application as a residue, SBP–1390 killed crickets more effectively than chlordane and German cockroaches better than malathion. It was also more effective than malathion against DDT-resistant house flies and far more effective than DDT against face flies.

When tested in insecticidal coils to repel northern house mosquitoes, SBP–1390 was as effective as pyrethrins.

Concentrations of the compound in water as low as .01 parts per million caused 100-percent mortality of backswimmer larvae within 1 day. This indicates a favorable degree of stability for SBP–1390 in a water medium.

SBP–1390 is still in the developmental stage and is neither registered nor recommended for the uses tested in these experiments. Before a pesticide can be released to the public it must undergo stringent tests by its manufacturer, who then submits test data to the Federal Government for evaluation and registration. □

Wax-coated capsule for calf rumen studies measures about 1 by 4 inches (PN–2001).

testing animals

Monitors without shackles

Mr. Riley observes temperature of sheep which was recorded on tape from signal sent by FM transmitter (PN–2002).

ADVANCES in radio telemetry are permitting scientists to continuously monitor more and more physiological and pathological characteristics of an animal without overly restricting its freedom of movement.

One device, a tiny FM transmitter surgically implanted in a penned but otherwise unrestrained animal, generates an audio frequency signal directly proportional to the animal's temperature. This signal modulates a radio frequency carrier and is transmitted to a standard FM receiver. From the receiver, the signal is channeled through a new, easily calibrated frequency-to-voltage converter to a strip chart recorder which graphs the animal's internal temperature for as long as the scientists may need, up to 6 months. The system has a maximum possible error of 0.2° C./month.

Developed by ARS biomedical engineer Joseph L. Riley, this radio telemetry system should enable scientists to obtain a more natural picture of body temperature changes in animals by avoiding the close confinement, artificial restraints, and other disturbances which may affect their response.

Mr. Riley, at the National Animal Disease Laboratory in Ames, Iowa, has also devised radio telemetry procedures for transmitting biopotentials such as electrocardiograph and electroencephalograph readings, blood pressure, ruminal activity, and respiration rate.

The inexpensive device for transmitting respiration rate is attached to a pneumograph (which records chest movement during respiration) placed around the animal's midsection. The transducer in this transmitter is a silicone rubber-covered coil or wire which expands and contracts—thus changing its electrical capacitance—according to pressure changes in the pneumograph. These fluctuations in capacitance frequency are picked up by a standard FM receiver, and the signal is subsequently recorded on a strip chart recorder in much the same way as in the body temperature monitoring system. An earlier transmitter devised by Mr. Riley radioed linear and accurate measurements of pneumograph variations, but it was unnecessarily accurate for its purpose, making it much too costly.

Other advances in veterinary radio telemetry include a wax-coated capsule stuffed with electronic gear which can transmit pressure changes in the volume of a calf's rumen. Designed by ARS physiologist Herbert M. Cook and Mr. Riley at NADL, the capsule can be swallowed by a calf and will run on its mercury battery for 23 days before needing a replacement cell. A lead weight prevents the capsule from being regurgitated. At present, it can be retrieved only by surgical incision. □

Genetic ceiling on SELECTIVE BREEDING

CAN MICE be selectively bred so they are as big as or bigger than rats? If so, could this genetic bonus be applied to livestock such as cattle? Over 40 years ago in 1930, a USDA scientist set out to answer these questions.

The late Hubert D. Goodale began what was to be the longest selection study in mammals ever attempted. Only recently did his colleagues terminate the research he began.

When Dr. Goodale set out to breed mice the size of rats, little was known about selective breeding. He wanted to find out just how effective selection for one trait would be. Mice were a logical choice for his experiment because they are small, reproduce rapidly, and are mammals as are domestic livestock. If the mice grew larger with each succeeding generation, perhaps cattle would also and open new vistas for beef production. Or would the mice stop getting bigger after many generations, indicating a limit to the effectiveness of selection for improving livestock?

After selection for 84 generations, the answer was plain. For 35 generations, the mice increased from a weight of 25 grams to 45 grams when weighed at 60 days of age. However, no increase in weight was noted after the 35th generation, even though selection continued for another 49 generations. The mice had reached a plateau and did not attain the size of rats as Dr. Goodale had suspected they might.

Dr. Goodale began his studies with 8 male and 28 female albino mice. The population was then closed. He selected for weight at 60 days of age keeping the heaviest of the mice as parents of the next generation.

Once a week, several virgin female mice were mated to several virgin males. The numbers varied, but usually five females were mated to each of three males. These mice, for the most part, were the largest available at the time. Uniformly large mice of one family were given preference over other families whose members were of variable weights. After weaning, if the mice were exceptionally large, their sires were mated to the same females.

The number of mice varied from 100 to 1,000 per generation with the average being 649. The number of sires and dams per generation averaged 37 and 100 respectively. In all, 54,535 mice were part of the experiment.

Having proven that size of mice reaches a pleateau after many generations of selection for one trait, it will be interesting to note further progress with cattle and other livestock. When will they, too, reach the limits of their genetic growth? □

Parasite ravages chukar partridge

THE STRANGE and often epidemic death of a handsome game bird, the chukar partridge, is no longer a complete mystery.

The chukar partridge was introduced into this country more than 30 years ago. Thousands were released, but they rapidly died off in many sections of the country and today survive in only small areas of the Far West.

Why? The answer lies partly in a common parasite, *Histomonas meleagridis*, which causes blackhead or histomoniasis in several species of ground-dwelling birds such as the turkey and chukar but only mildly infects resistant chickens and pheasants. Chukars inhabiting the same ranges as another popular game bird, the ringneck pheasant, probably died off when they contracted blackhead from the pheasants, which are resistant to the disease.

In demonstrating the susceptibility of chukars to blackhead, ARS parasitologists Everett E. Lund and Anne M. Chute at Beltsville, Md., fed either cecal worm eggs or earthworms which carry cecal worms to young chukars, chickens, and turkeys.

To show the wide distribution of blackhead infections, the scientists dug earthworms from three locations—a game farm, a Federal game preserve, and a hunting tract. These areas had been used almost exclusively for ringneck pheasants.

Feeding the cecal worm eggs resulted in a higher mortality of chukars, both young and older birds, than in either turkeys or chickens.

When fed worms dug from the game farm, the chukars were three times as susceptible as turkeys and also showed more severe tissue damage than the other birds. Both chukars and turkeys developed blackhead while the chickens were highly resistant when fed earthworms from the game preserve. With earthworms from the hunting tract, 80 percent of the chukars and chickens became infected. Incidence in turkeys was low.

The researchers note that chukars shed the cecal worms before the worms can transmit the blackhead parasite. This indicates that chukars are poor parasite hosts though they readily succumb to infection. Therefore, the parasites are not likely to persist on ranges inhabited solely by the chukar, and the chukar will present no threat of contamination of ranges with either cecal worms or blackhead parasites.

Chukars may be raised successfully on game farms, but they must be kept off the ground on wire runs and away from pheasants. The birds are prolific and, if kept free of blackhead infection, are easily raised.

Though at present the ringneck pheasant and the chukar partridge cannot long share a common range, Dr. Lund and Mrs. Chute hope to find a means of biological control of the blackhead parasite so that these two game birds may one day coexist. □

Blackhead organisms infect the cecum or intestinal pouch of their host and may also invade the liver and peritoneal cavity. The host picks up the blackhead parasite in eggs of another parasite, the cecal worm, or by eating earthworms which may be carrying cecal worm larvae. The larvae, whether hatched in the bird or in the earthworm, may carry blackhead parasites with them to the bird's cecum. Here, the parasites are released and multiply. Although the resulting disease is fatal to turkeys, it is no longer a problem where effective control measures are used.

Top left: *Dr. Lund and Mrs. Chute examine a chukar partridge for early signs of blackhead disease (1271K1490–22).*

Top right: *Dr. Lund digs earthworms from soil known to be contaminated with the blackhead parasite (1271X1527–9).*

Above: *Cecal worm eggs suspended in a saline solution are introduced by pipette into bird's crop to produce artificial infestation (1271K1489–10).*

Left: *Dr. Lund selects mature female cecal worms collected from one group of birds to feed to another group to test for transmission of the blackhead parasite (1271X1527–20).*

Male-only... HOUSE FLIES

Male house flies newly emerged from their pupal cases have not had time to expand their wings to normal size (BN–38626).

Dr. McDonald checks temperature control of rearing chamber (BN–38625).

GENETIC ENGINEERING has achieved a male-producing strain of house flies which could reduce the cost and time required to separate flies by sex in possible sterilization programs.

Sterilization programs involve rearing insects in a laboratory, sterilizing the males, and releasing them in quantities sufficient to significantly outnumber native males; as a result, almost all matings occur between normal females and sterilized males.

Sterilized insects carry defective chromosomes so that matings between treated and normal insects result in eggs that do not hatch. The principle works with several species of flies, and preliminary studies indicate that it may also be useful with the house fly.

Scientists would prefer to sterilize and release only males because females usually mate only once but males mate many times. Previously, the only means of obtaining males for release required separating the sexes by mechanical devices or sexing by hand. Unfortunately, mechanical devices are not 100-percent efficient, while hand sexing is both time-consuming and costly.

The problem of sexing house flies could be solved by the male-producing strain developed from different studies conducted over a 7-year period at the ARS Metabolism and Radiation Research Laboratory, Fargo, N. Dak. Entomologists at Fargo engineered the new strain by manipulating unusual genetic traits found on the same chromosome in two strains of dissimilar origins.

Entomologist Dale E. Wagoner first found that one chromosome of the third pair of chromosomes is inherited by males only in a strain of flies from Florida. Later, entomologist Ian C. McDonald isolated a heat-sensitive lethal factor on the third chromosome in a strain of flies from North Dakota. The heat-sensitive factor resulted in death to flies reared at 92° F., and was recessive, that is, inactive unless it was carried by both members of the third chromosome pair.

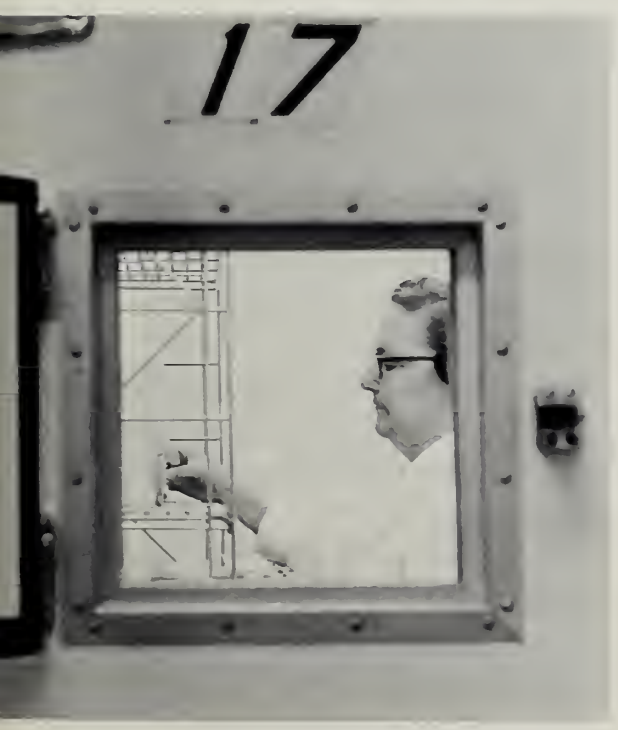
Dr. McDonald then crossed flies bearing the heat-sensitive trait with the Florida flies and through proper genetic manipulation, obtained a strain in which males always inherit the temperature dependent factor on only one member of the third chromosome pair

while females always receive the same temperature factor on both of their third chromosomes.

Accordingly, when the offspring of this strain are reared at temperatures above 92° F. the females die in the pupal stage and only adult males emerge from their pupal cases. Both sexes survive when reared at 78° F., a temperature not hot enough to activate the heat-sensitive lethal factor. Thus, males for sterile male release programs could be obtained merely by elevating rearing temperatures from 78° to 92°.

Another advantage of high-temperature rearing would be a reduction in rearing time because the immature stages develop faster. Reduced rearing time would offer scientists greater flexibility in timing rearing operations for programs requiring certain numbers of insects at specific intervals.

Additional studies are in progress to obtain a heat-sensitive factor acting in the egg stage. Females could then be killed before hatching, and twice as many males could be obtained from a given volume of food material in which the insects are reared. □



Technician Delores Overland places containers of house fly pupae into chamber for rearing at the desired temperature and humidity (BN–38624).

Peanuts/
FOILING THE FALL ARMYWORM

PLANTING the peanut variety least preferred by fall armyworms can curb the moth's population.

Investigations led by entomologist Donald B. Leuck at the ARS Southern Grain Insects Research Laboratory, Tifton, Ga., determined probable effects of the more resistant foliage on the insects' field populations and biology. The Georgia Agricultural Experiment Stations, Athens, cooperated.

Insecticidal control of the fall armyworm and other insects contributes significantly to increased peanut production costs. Results of the study suggest that plant breeding to incorporate insect resistance may aid other control measures and reduce insecticide use.

Some 14 standard peanut varieties were rated for preference resistance to foliage-feeding insects in the field. Similar preferences were expressed often by two or more insect species feeding simultaneously on the forages. Starr was found most preferred and Southeastern Runner 56–15, least preferred. Other insect species in the foliage-feeding complex included the corn earworm and the velvetbean caterpillar.

The effect of the resistant variety upon armyworm populations was cumulative. Some 64 percent of the pupae associated with the Starr variety generated moths compared with 52 percent for Southeastern Runner 56–15. Moreover, the average life cycle of the insect, as measured in days from first oviposition of one generation to oviposition of another generation, was longer for the Southeastern Runner 56–15 by more than 4 days.

A mated fall armyworm moth may produce an average of about 1,000 eggs. If Southeastern Runner 56–15 foliage were the moth's only food source, its seasonal reproductive potential in the Tifton area could be reduced by about 4 trillion fewer eggs than would be realized from larvae feeding on Starr.

Furthermore, in several years, considerably fewer generations would develop if Southeastern Runner 56–15 were to completely replace Starr as a feeding option.

However, other environmental resistance factors affect insect populations. In the Gulf Coast States, for example, fall armyworms feed upon many host crops such as cotton, tobacco, grasses, legumes, and vegetables. Nevertheless, it appears that the factor of resistance in peanut foliage and other crops could be manipulated in future crop breeding programs to exert a constant effect on fall armyworm populations.

Germ plasm resources at Tifton include approximately 3,500 peanut lines. Some 1,700 of these have been screened for foliage resistance. About 40 entries are now known for nonpreference-type resistance to the larval species complex, mostly to a greater degree than Southeastern Runner 56–15. So with further development of strains resistant to insects, possible reduction of insecticidal control may be realized. □

Unmodified range at left contrasts with contour furrowed land, here in the second year after treatment (PN–2003, PN–2004).

Northern Great Plains

SOIL TREATMENTS INCREAS

MODIFYING the surface of semiarid rangelands in the Northern Great Plains can significantly improve the efficiency with which native plants use available water for forage production.

On semiarid rangeland, water plays a primary role in determining what kind and how much vegetation is present. Because of their limited production potential, these rangelands are not economically suitable for many of the intensive management practices used on cultivated lands.

Range scientist J. Ross Wight and soil scientist Francis H. Siddoway, both of ARS at Sidney, Mont., evaluated five soil surface modification treatments to determine their effect on precipitation-use efficiency (PUE). PUE is the number of pounds per acre of oven-dry vegetation produced for each inch of precipitation. It is based on the plant growth and precipitation that occurs between harvests.

The surface modifications tested were contour furrowing, pitting, miniature fallowing, scalping, and rotary subsoiling. Contour furrowing and pitting are designed to prevent water from running off the land surface. Scalping is a way of preparing seedbeds for introducing desirable species of vegetation into the area. Rotary subsoiling helps prevent runoff and improve infiltration of water by fracturing the subsoil. All five were compared with the results of fertilizer applications in previous tests.

The effects of the treatments on PUE were mixed. On clay soils with low water infiltration, the contour furrowing method increased PUE more than 100 percent. On coarse-textured soils with high water infiltration, pitting and scalping increased PUE but not as much as fertilizer applications did.

All beneficial effects resulted from increased soil water, better balance of plant species in favor of high-producing varieties, and the increased availability of nutrients.

Soil water was increased through the prevention of runoff, trapping of snow, and reduction of the number of plants competing for water. However, only during periods of intense rainfall or on sites with low infiltration capacity or steep slopes were treatments effective.

One of the most beneficial effects was

FORAGE

that on species composition and balance. Low-producing species of forage vegetation were removed by tillage, thus allowing for the natural invasion or reinvasion by more favorable species for grazing.

Nutrient availability appeared to play a major role in growth limitation. Any tillage treatment usually increases release of plant nutrients from the soil, although not as effectively as fertilizer. Fertilizing is, however, much more costly. Results showed that surface modification treatments creating the greatest disturbance have the greatest fertility benefits. This effect, however, usually disappears in a few years.

How well each of the soil modification treatments succeeds depends on characteristics of the area. □

Combatting soil crusts

CRUST FORMATIONS on calcareous soils may be significantly reduced—and seedling emergence enhanced—by spray applications of phosphoric acid.

Crusting seriously impedes seedling emergence and growth uniformity of stands of such crops as sugar beets, cotton, common vegetables, and small grains. Sulfuric acid treatments, although potent as an anticrusting measure, are a distinct hazard to men and equipment. Crusts can be alleviated by frequent light irrigations, plastic and other type coverings, and synthetic soil conditioners. Mechanical methods of obtaining satisfactory crop stands include punch planting and shallow cultivations. But these procedures are usually too expensive or only partially effective.

Phosphoric acid, however, may provide the most economical, safe, and effective way to meet the problem. When phosphoric acid touches soil, it is immediately adsorbed. It does not leach or run off unless the soil does.

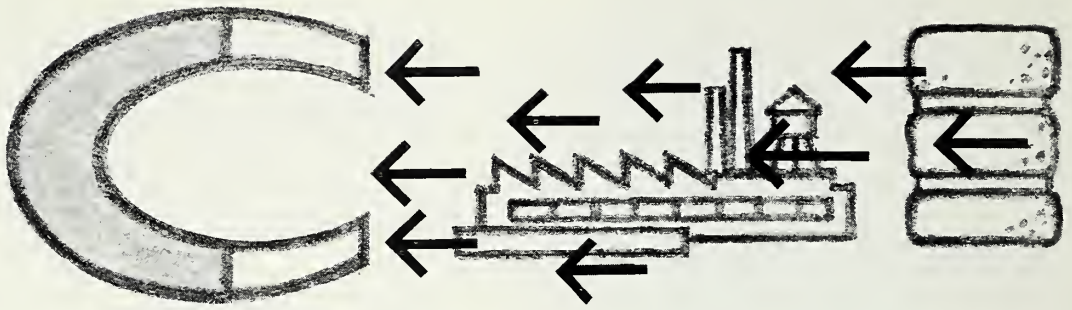
By spraying 140 gallons of dilute (12 percent) agricultural grade phosphoric acid per acre in bands on sugar beet rows simultaneously with seeding, ARS soil scientists Charles W. Robbins, David L. Carter, and Glen E. Leggett were able to decrease crusting and increase sugar beet stands to near ideal after thinning. Tests were conducted on Portneuf silt loam.

In similar attempts, disking in iron sulfate and calcium sulfate with superphosphate failed to reduce crusting or increase seedling emergence.

Crusting results from the structural breakdown of soil aggregates. In combating this condition, the phosphoric acid is apparently neutralized by the calcium and magnesium present in the soil. The solubilized calcium and magnesium ions are then free to combine with phosphate from the acid and act as cementing agents for soil aggregates. This cementing with calcium and magnesium phosphate increases water stability of the soil aggregates, thereby inhibiting their dissolution and the subsequent formation of crust.

The phosphoric acid needed to check soil crusting also satisfies the phosphorus requirement of the crop itself. Mr. Robbins and his coresearchers at Kimberly, Idaho, believe that this combination of phosphorus fertilizing with crust-retardant capabilities should be effective in preventing crust formations over other crops seeded in calcareous soils. □

magnetic cotton



BY MAKING cotton fibers respond to magnetic forces, scientists hope to open the way to an entirely new method for processing raw cotton fibers into textiles.

Cotton processing techniques have remained essentially unchanged over the past 200 years. More than a dozen different steps are necessary, and between each step workers ranging from unskilled through the very highly skilled are required to handle the cotton.

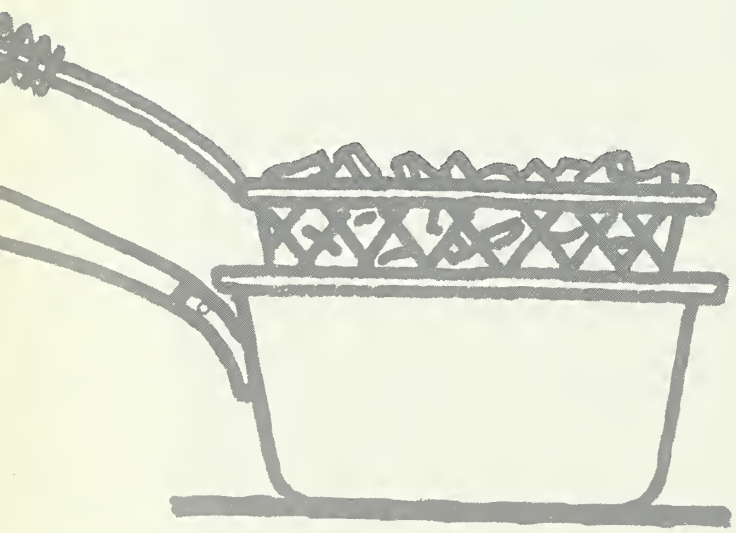
What is needed is an entirely new system that will not only eliminate many of the steps but also most of the costly and time-consuming handling. One idea, still in the early experimental stages, is manipulating the cotton fibers through the use of magnetic forces.

ARS scientists reason that if cotton fibers can be treated so they will respond to magnetic forces, then weak magnetic fields can be used to move the fibers about freely from the bale into yarn in one continuous operation. Physicists Devron P. Thibodeaux and Albert Baril, Jr., working at the ARS Southern regional laboratory, New Orleans, La., have succeeded in making small amounts of cotton responsive to magnetic forces.

They tested a variety of materials, but the most promising was finely powdered pure iron particles with diameters of about one-tenth those of the cotton fibers. These particles were most evenly distributed when suspended in a wetting agent made of partially neutralized oleic acid. In effect a dilute soap solution, the wetting agent dispersed the particles evenly over the individual fibers without causing them to stick together. It actually tended to lubricate the fibers. The iron can be easily washed away at any point. There is little likelihood of chemically altering the cellulose; thus, the fabric could be chemically treated for a variety of effects such as durable press.

Preliminary tests show no significant reduction in breaking strength or tenacity of the treated fibers either from the action of the treatment or the weak magnetic forces used. □

french fried ...yams?



TRUE YAMS, a popular root crop in Puerto Rico as well as in most tropical areas, may have potential as chips and fries.

As part of an overall project to find more uses for tropical root crops, ARS is testing yams because not only are they popular, but they also have more protein value than some of the other root crops. The project is sponsored jointly by ARS and the Agency for International Development.

ARS plant geneticist Franklin W. Martin at the Federal Experiment Station, Mayaguez, Puerto Rico, tested 25 varieties for use as chips and french fries. These are true yams of the *Dioscorea* species, and should not be confused with yam-type sweet potatoes which botanically are *Spomoea batatos*, an entirely different vegetable crop.

Dr. Martin made the chips in a household deep fat frier at 375° F., using commercial corn oil. One variety, Farm Lisbon, was tested with various cooking fats. An informal panel of judges rated the chips on tendency to stick, crispness, color, flavor, and bitterness.

Two varieties well known in Puerto Rico were outstanding in these tests: Forastero for both chips and fries and Farm Lisbon for chips.

The varieties that made the best chips also proved best for fries. These varieties have white, compact flesh with minimum graininess and a low tendency for flesh oxidation.

In addition to corn oil as a cooking fat, a 40–60 mixture of lard and hydrogenated vegetable oil proved satisfactory and was preferred to corn oil by half the panel members. □

AGRISEARCH NOTES

Easy-to-make water sampler

A simple new water sampling device can be easily constructed from readily available, low-cost materials found in most laboratories.

ARS soil scientist Lowell E. Allison, Chickasha, Okla., developed the sampler and found it capable of lifting water from as deep as 23 to 26 feet. Ground waters are often needed by scientists to more fully interpret soil salinity data, especially where the water table is near or within the root zone. The sampler can be used to obtain ground waters from auger holes and shallow wells and even surface waters from streams.

The only materials needed are a pint milk bottle; a metal vacuum pump with adequate suction (a modified grease gun was used in these experiments); about 12 feet of transparent plastic tubing; 4 to 6 feet of aluminum tubing, closed on one end, with about 12 holes, ⅛ inch in diameter at the bottom of tube; check valves for vacuum control; some T- and L-shaped metal connectors; a 2-hole rubber stopper; and a ringstand with a buret clamp for stability.

To assemble, place the stopper in the bottle with an L-shaped connector in one hole and a T-shaped connector in the other. Attach the plastic tubing to the L-shaped connector. Attach the vacuum pump and vacuum control check valves to the T-shaped connector. Place the bottle on the ringstand and attach the buret clamp to the T-shaped connector. After determining the depth of the water table, attach the aluminum tubing to the other end of the plastic tube, lower it to the water level, and pump.

To find the depth of the water table, detach the plastic tubing from the collection bottle and lower it into the hole; blow through the tube as it lowers. The first evidence of bubbling indicates the level, and markings on the tubing will provide the exact water table depth.

Japanese beetles face new weapon

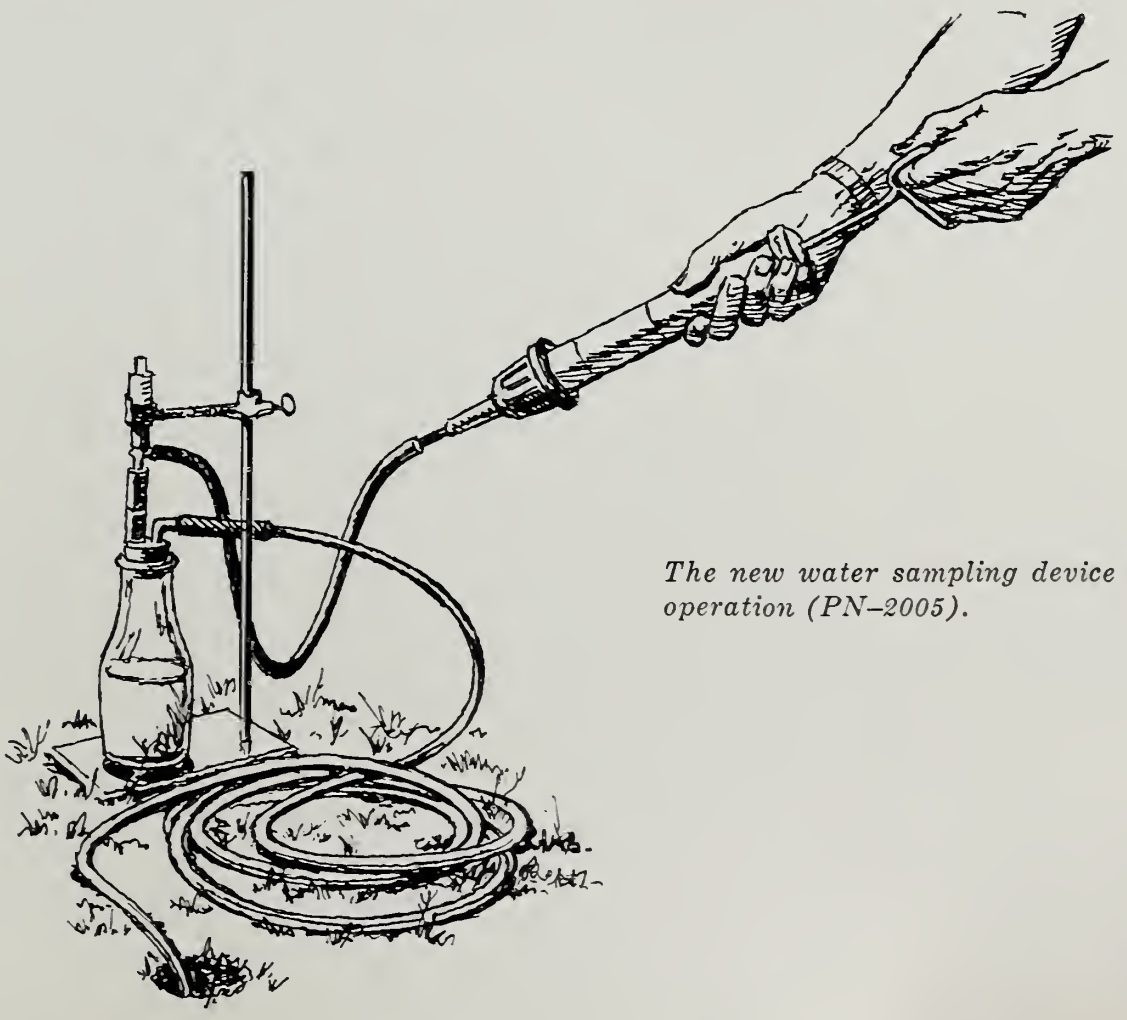
A potent new lure for Japanese beetles is more than four times as attractive as the standard lure, a phenethyl butyrate and eugenol mixture.

Odor provides a means for the beetles to find many of some 275 plants upon which they feed. Powerful lures, more attractive than odors of their natural foods, divert the beetles into traps which serve as a survey tool. The beetles may be destroyed in the traps without use of insecticide.

In the latest ARS tests to find more effective attractants, phenethyl propionate+eugenol was the most powerful lure of 23 chemicals tested.

ARS entomologist Thyril L. Ladd and technician John P. Jurimas in work done at Moorestown, N.J., with chemists Terrence P. McGovern, Morton Beroza, and John C. Ingangi, Beltsville, Md., found phenethyl propionate+eugenol nearly 2.4 times more powerful than the next most powerful attractant tested, methyl cyclohexanepropionate+eugenol. It was also about five times longer lasting.

Effective trapping of Japanese beetles with attractants may ultimately offer a control alternative to milky spore disease. This disease, induced by bacteria, was developed in earlier ARS studies as a biological control (AGR. RES., Dec. 1964, p. 14). The method has met with considerable success and is now spreading naturally. Even where the disease is well established, however, there have been local and still not understood upsurges of the insect.



The new water sampling device in operation (PN–2005).

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Light control speeds mink pelting

Existing sheds on mink farms converted into controlled light houses can turn out mink that are ready for pelting 6 to 8 weeks sooner.

ARS in cooperation with Cornell University, Ithaca, N.Y., obtained these time savings in a mink shed in which sections had been enclosed and insulated and restricted light control, ventilation, and exhaust systems installed.

Forty pastel mink—20 young and 20 adult, each group half male and half female—were placed in the modified section of the shed. Forty control mink were placed in an unmodified section of the shed. All were fed similar diets.

In this particular test, the mink in the light-controlled shed received 4 hours of light a day and were ready for pelting 6 weeks before the controls.

Calving-estrus interval under study

Allowing a calf to suckle its dam increases the interval from calving to first estrus of the cow.

When the cow does not nurse her calf or when the cow has been mastectomized (had her udder removed) the interval from calving to first estrus is progressively shortened. Mastectomy prevents milk production and stimulation of the nerves caused by the build-up of milk in the udder.

These findings were part of an experiment conducted by ARS in cooperation with the Montana Agricultural Experiment Station, Bozeman, and the University of Manitoba, Winnipeg.

Thirty-four Angus cows were used in the study—12 were suckled, 13 were not suckled but their mammary systems were intact, and 9 were mastectomized before 150 days of gestation. The cows were divided into three groups after calving and were fed a ration to maintain their body weight.

Though mastectomized cows came into heat earlier than the other two groups of cows, the interval from calving to conception was about the same for all three groups. This indicates that the first estrus period may not be normal since fertility is low during this time.

Further investigations may lead to the causes for both the shortened time to estrus and the low fertility rates at this time.

New table for Udy dye-binding tests

A new conversion table for the Udy dye-binding method increases the accuracy of protein content measurements in wheat.

Udy dye-binding actually measures the amino acids, but the results can be translated into protein content with the use of a table.

The earlier Udy conversion table was probably accurate when developed, but it now measures low-protein wheat about 0.8 percent too low and the high-protein wheat about 0.4 percent too high.

In Udy dye-binding, the monosulfonic dye, acid orange 12, is used to precipitate proteins from solution. Color intensity read by colorimeter diminishes as the reaction occurs. Table readings for protein estimates are based on the colorimeter measurement of unbound dye through its relationship to total nitrogen as determined by a procedure such as the Kjeldahl.

ARS chemist Walter T. Greenaway, Beltsville, Md., developed the new conversion table, basing it on an equation derived from curvilinear regression. This table brings the dye-binding results into good agreement with results from Kjeldahl and biuret procedures for all wheat classes. Kjeldahl and biuret methods provide direct measurements of wheat protein.

An experiment involving 100 samples of wheat showed no significant differences among results obtained from the three protein analysis methods when Mr. Greenaway's conversion table was used. In a similar test using the original conversion table, Udy dye-binding and Kjeldahl results differed significantly.

When reporting research involving pesticides, this magazine does not imply that any pesticide uses discussed have been registered. Registration is necessary before recommendation. Pesticides can be injurious to humans, domestic animals, desirable plants, and fish or other wildlife—if not handled or applied properly. Use all pesticides selectively and carefully.

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